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Application Serial No. 10/527,637  
Reply to Office Action of June 6, 2007

PATENT  
Docket: CU-4117

**REMARKS**

In the Office Action, dated June 6, 2007, the Examiner states that Claims 7-16 are pending, Claims 13 and 14 are withdrawn from consideration, and Claims 7-12, 15 and 16 are rejected. By the present Amendment, Applicant amends the claims.

It is noted that withdrawn Claims 13 and 14 depend from Claims 7 and 8, and that the previous restriction requirement was provisional. If a generic linking claim is finally held allowable, the Applicant requests that Claims 13 and 14 be rejoined.

In the Office Action, Claims 7-10 and 15-16 are rejected under 35 U.S.C. § 102(b) as being anticipated by Phillips (U.S. 2,712,971). Claim 11 and 12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Phillips.

The Applicant has cancelled Claims 11 and 12 and incorporated the features of those claims into amended independent Claims 7 and 8.

The present invention claims an oil ring that is of a two-piece configuration type that is "formed into cross-section substantially of an I-shape that two rails are connected at a columnar portion thereof." Thus, the upper and lower rails of the oil ring of the present invention slide together which results in the contact between the sliding surface and the cylinder surface being constant. In contrast, Phillip discloses a piston ring of a three-piece configuration type so that upper and lower rails are formed independently. In Phillips, the upper and lower rails are fixed in a manner in which there is usually a certain amount of clearance between the rail and the flange. Therefore, each rail slides on the cylinder surface independently so that the contact between the sliding surface and the cylinder surface is not constant at all times. Thus, the configuration claimed in the present invention is distinguishable from that disclosed in Phillips.

Generally, because of the constant contact, the sliding surface of the two-piece configuration type is worn locally; however, the present invention overcomes the particular shortcomings of the two-piece configuration type oil ring by modifying the shape of the sliding projection. The present invention claims the sliding surface, the outer side surface of the sliding projection and the inner side surface of the sliding projection in the oil ring, is not in symmetry about the centerline. Independent Claim 7 of the present application claims the angle of the outer edge portion (angle  $\gamma$  formed by the outer side surface of sliding projection 7 and sliding surface 6; Fig. 2) can be made larger because "a taper angle of the outer side surface of sliding

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surface. Thus, it is possible to prevent concentration of excessive pressure at the outer edge portion, and reduce the sliding friction. Similarly, independent Claim 8 of the present application claims the sliding surface, the outer side surface of sliding projection and the inner side surface of the sliding projection, is not in symmetry about the centerline. Furthermore, the present invention claims the outer edge portion is formed into a curved surface, and a curved surface sliding portion is provided. By providing the curved surfaces, the concentration of excessive pressure at and around the sliding surface can prevent an increase in the sliding friction.

In contrast, Phillips discloses that the shape of the sliding surface and area around thereof is symmetrical about the centerline in a piston ring axial direction. The upper region and the lower region of the sliding surface are formed in symmetrical shape about the centerline, and the inclination angle of the outer and inner beveled surface of the rail is the same. Therefore, Phillips cannot anticipate the present invention because Phillips does not disclose a sliding surface not in symmetry with the centerline as is claimed in the present invention.

Furthermore, the present invention claims a thin-type oil ring which results in the reduction of sliding friction and oil consumption. In contrast, the oil ring disclosed in Phillips has a configuration in which each of the upper and lower rails is sandwiched by independent flanges; therefore, the oil ring of Phillips cannot be a thin-type oil ring because it requires many parts which will increase its size. Moreover, the oil ring configuration disclosed in Phillips may result in increased oil consumption because of the oil used upon sliding of the piston through the clearance between the upper/lower rails and the flange, or upper/lower surfaces of the flange that is not sealed with the upper/lower rails. Additionally, the configuration disclosed in Phillips may cause defects because of the high risk of abrasion between the rails and the flanges. Therefore, because of the various distinguishing characteristics, Phillips does not anticipate the present invention.

With respect to the obviousness rejection, the Applicant respectfully disagrees and transgresses the rejection. The present invention claims that a radial width of the oil ring, which is from the portion where the curved surface sliding portion and the outer side surface of sliding projection are joined to each other to the portion where the sliding surface and the inner side surface of sliding projection are joined to each other, is from  $3\mu\text{m}$  to  $100\mu\text{m}$ . In the present invention, sliding friction can be

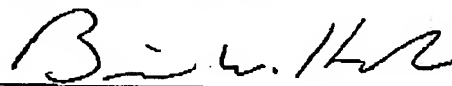
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reduced while maintaining the functions as an oil ring by keeping the radial width in the claimed range. This result is shown in Figs. 10 and 11 of the present application, which show a mechanical loss (FMEP) caused by friction and oil consumption rate of a conventional oil ring in comparison to that of the oil ring of the present invention. The data shows that unexpected effects can be obtained by having a radial width in the  $3\mu\text{m}$  to  $100\mu\text{m}$  range, and therefore, the Applicant considers this indicates that the claimed range is not obvious.

In light of the foregoing response, all the outstanding rejections are considered overcome. Applicant respectfully submits that this application should now be in condition for allowance and respectfully requests favorable consideration.

Respectfully submitted,



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Date

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